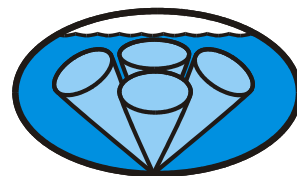


Ocean Surveyor Ocean Observer

Maintenance Guide



RD Instruments

Acoustic Doppler Solutions

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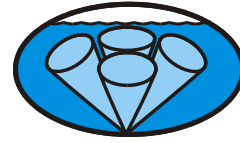
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NOTES



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Ocean Surveyor/Observer Maintenance Guide

1 Introduction

This guide explains how to do certain maintenance/repair, and how to prepare the Ocean Surveyor/Observer for storage or shipment.



NOTE. Servicing instructions are for use by service-trained personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so.

2 Spare Parts

The following parts are included in the spare parts kit.

Table 1: Spare Parts

Item ID	Description	Where Used
2-020-70SH-EP	O-ring	End-Cap/Top Hat connector
2-022-70SH-EP	O-ring	I/O Cable
DC-111	Lubricant, silicone	O-ring lubricant
314025	Fuse, 25A Fast blow, 3AB	Power Assembly PCB
M4x0.7x6PH	Screw, pan head, SST	Electronic Chassis cover



NOTE. RDI recommends that the Top Hat O-rings be replaced whenever the transducer assembly is opened. These O-rings are **not** included in the spare parts kit. Make sure you have replacement parts **before** opening the transducer (see “O-Ring Inspection and Replacement,” page 10).

3 Electronics Chassis Board Replacement

Printed Circuit Board (PCB) removal and replacement may occur during system upgrades. Damage to the board or its components can occur if you do not follow the guidelines in this section. Refer to [Figure 1, page 3](#) through [Figure 4, page 4](#).



CAUTION. Static electricity can damage board components. RDI recommends using an earth-grounded wrist strap to help prevent such damage. You must have the wrist strap on whenever you handle a board.

- a. Turn off power to the electronic chassis. Disconnect the power and gyro interface cables to ensure that no power is applied.
- b. Remove the Electronics Chassis top cover. The cover is held in place with four screws on the corners of the cover. Remove all screws and lift the cover slowly.



CAUTION. Do not break the grounding wire attached to the cover.

- c. A grounding wire is attached to the underside of the top cover. Unplug the ground wire from the tab on the top cover and lift off the cover. You now have access to the electronic chassis circuit boards.
- d. Attach an earth-grounded wrist strap. Locate the board needing removal. Disconnect all cables going to the board. Remove the board.



NOTE. Save all hardware.

- e. Before replacing a board, be sure you have the correct one. Reconnect all cables.



NOTE. Replace all hardware that was removed (i.e. flat washers, split-lock washers, screws, etc.).



NOTE. Removing and replacing the Power Assembly Board is not easy. **RDI does not recommend replacing this board in the field.**



CAUTION. The LCD Display is part of the Front Panel Interface PCB. Removing this board requires removing the front cover and unplugging the AC power wires to the power switch. It is critical that the wires to the power switch be plugged back in correctly. **RDI does not recommend replacing this board in the field.**

- f. Plug the ground wire to the tab on the top cover. Replace the chassis top cover.

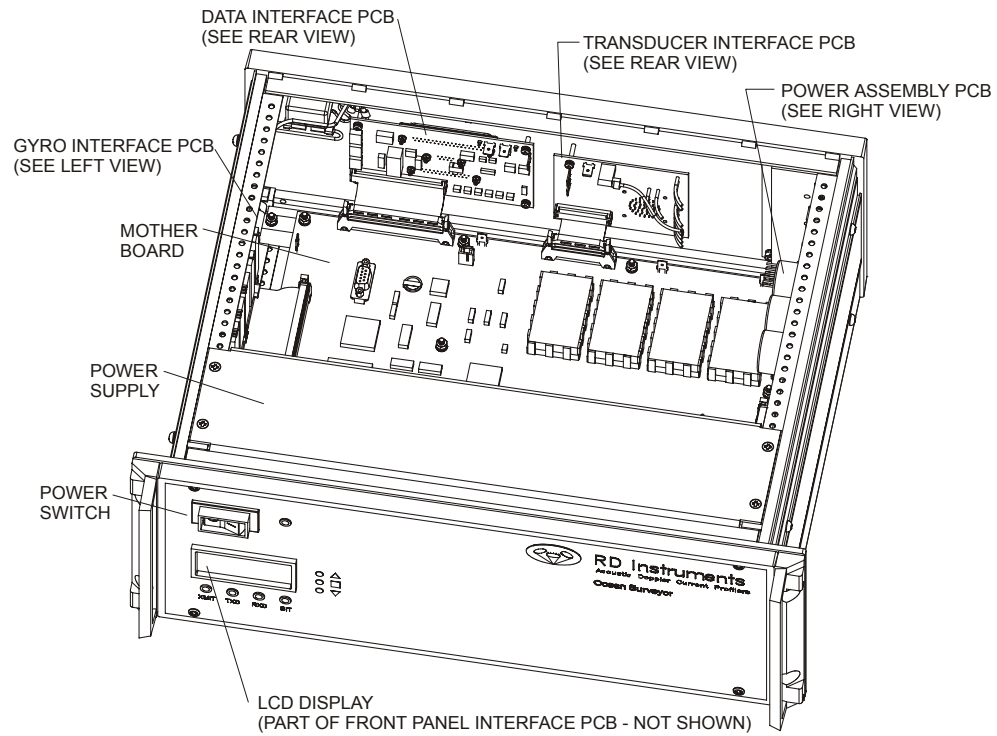


Figure 1. Electronic Chassis (Top View)

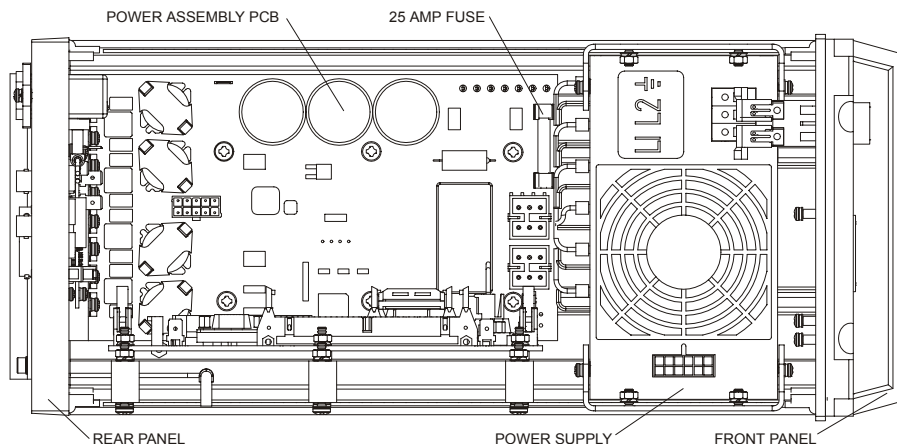


Figure 2. Electronic Chassis (Right View - Looking Toward the Power Assembly PCB)

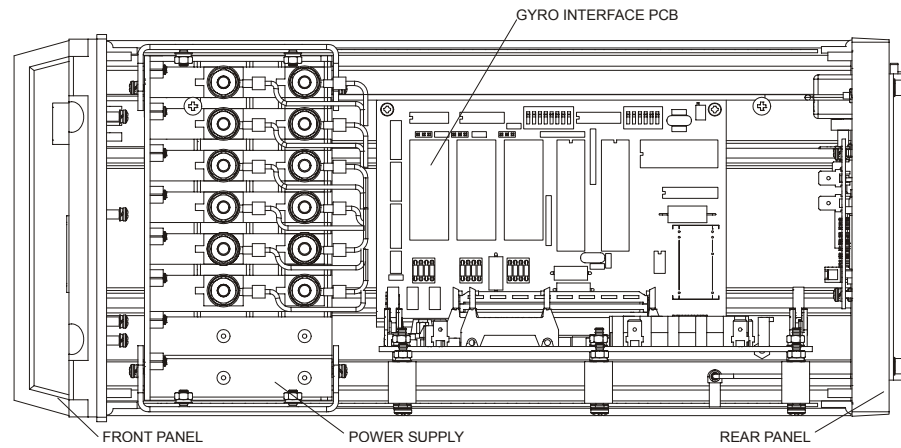


Figure 3. Electronic Chassis (Left View - Looking Toward the Gyro Interface PCB)

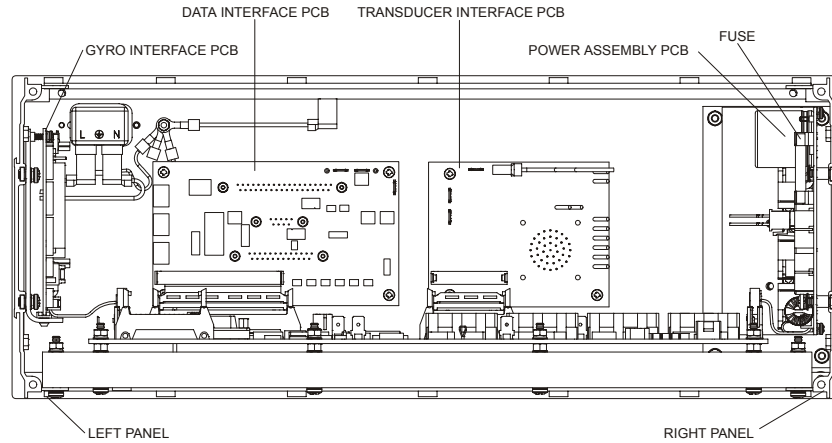


Figure 4. Electronic Chassis (Rear View - Looking Toward the Data Interface PCB)

4 Transducer Board Replacement

Access to the Printed Circuit Boards (PCB) in the transducer is not normally required for routine maintenance. RDI does not recommend opening the transducer housing unless necessary. Damage to the board or its components can occur if you do not follow the guidelines in this section.



CAUTION. Static electricity can damage board components. RDI recommends using an earth-grounded wrist strap to help prevent such damage. You must have the wrist strap on whenever you handle a board.



NOTE. Spare O-rings and desiccant must be ordered to properly seal the transducer. Ensure you have these parts **before** you open the transducer.



NOTE. Use a marker pen on the end cap/Top Hat assembly to note the transducer forward mark. When you reassemble the transducer, you need to put the end cap/Top Hat assembly back in the same position.

- a. Attach an earth-grounded wrist strap.
- b. Remove the end-cap/Top Hat assembly on the transducer. The end cap is attached to the beam former and TCM2 compass (Ocean Observer system only) by a cable (see [Figure 5, page 7](#) and [Figure 6, page 8](#)). The end-cap cannot be removed until the cable has been disconnected.
- c. Disconnect the Internal I/O cable from the Beam Former PCB.



NOTE. The 75 kHz transducer uses a one-piece Top Hat assembly (see [Figure 6, page 8](#))

Ocean Observer Systems with TCM2 Compass Only

1. The Beam Former board must be removed to gain access to the cable on the compass. The beam former connector unplugs from the transducer connector by turning the knobs to release the locking mechanism, then pulling the two apart.
2. The small connector from the end-cap is plugged into the compass. The top cover of the compass box must be removed in order to unplug the connector from the TCM2 PCB.
- d. Before installing the end-cap or Top Hat (75 kHz), check that all cables have been reconnected and all hardware are tight.
- e. Replace the desiccant (see [“Desiccant Bags,” page 9](#)).
- f. Inspect the O-rings. When viewed with an unaided eye, the O-rings must be free of cuts, indentations, abrasions, foreign matter, and flow marks. The O-ring must be smooth and uniform in appearance. Defects must be less than 0.1 mm (0.004 in.).



NOTE. RDI recommends you use new O-rings if you are preparing for a deployment.



CAUTION. If the O-ring appears compressed from prior use, replace it. **Weak or damaged O-rings will cause the ADCP to flood.**

- g. Clean and inspect the O-ring grooves. Be sure the grooves are free of foreign matter, scratches, indentations, corrosion, and pitting. Run your fingernail across damaged areas. If you cannot feel the defect, the damage may be minor; otherwise, the damage may need repair.



CAUTION. Check the O-ring groove thoroughly. **Any foreign matter in the O-ring groove will cause the ADCP to flood.**

- h. Lubricate the O-ring with a thin coat of DC-111 lubricant. Apply the lubricant using latex gloves. Do not let loose fibers or lint stick to the O-ring. Fibers can provide a leakage path.



NOTE. RDI uses Dow Corning's silicone lube model number 111 but any equivalent silicone O-ring lube can be used.



CAUTION. Apply a **very thin** coat of silicone lube on the O-ring. Using too much silicone lube on the O-ring can be more harmful than using no O-ring lube at all.

- i. Place the end-cap on the transducer housing, aligning the mating holes and the Transducer Forward mark for orientation. When mating the end-cap with the housing, apply equal pressure to all parts of the O-rings. Make sure the face and bore O-rings remain in their retaining grooves.
- j. Examine the end-cap assembly bolts and washers for corrosion; replace if necessary. *All* the hardware items are needed to seal the Ocean Surveyor/Observer properly.
- k. Install all sets of hardware until “finger-tight.”
- l. Tighten the bolts in small increments in a “cross” pattern until the split washer flattens out, and then tighten each bolt $\frac{1}{4}$ turn more to compress the face seal O-ring evenly. Tighten the bolts to the recommended torque value of 5.6 Newton-meters (50 pound-inches).



CAUTION. Apply equal pressure to the O-rings as you tighten the bolts. If one bolt is tightened more than the others, the O-rings can become pinched or torn. **Damaged O-rings will cause the system to flood.**



CAUTION. Check that no wires or any other object is pinched between the end-cap/Top Hat and the transducer housing. Use rubber bands to hold the wiring in place as necessary. **If the O-ring is not in the groove or if a wire or other object is pinched, the ADCP will flood.**



CAUTION. Do not over tighten the bolts that hold the transducer housing and end-cap together. If you over tighten, you can strip the bolts. On the other hand, **leaving the bolts too loose can cause the system to flood.** Tighten the hardware to the recommended torque value.



NOTE. The recommended torque value for the end-cap bolts is 5.6 Newton-meters (50 pound-inches).

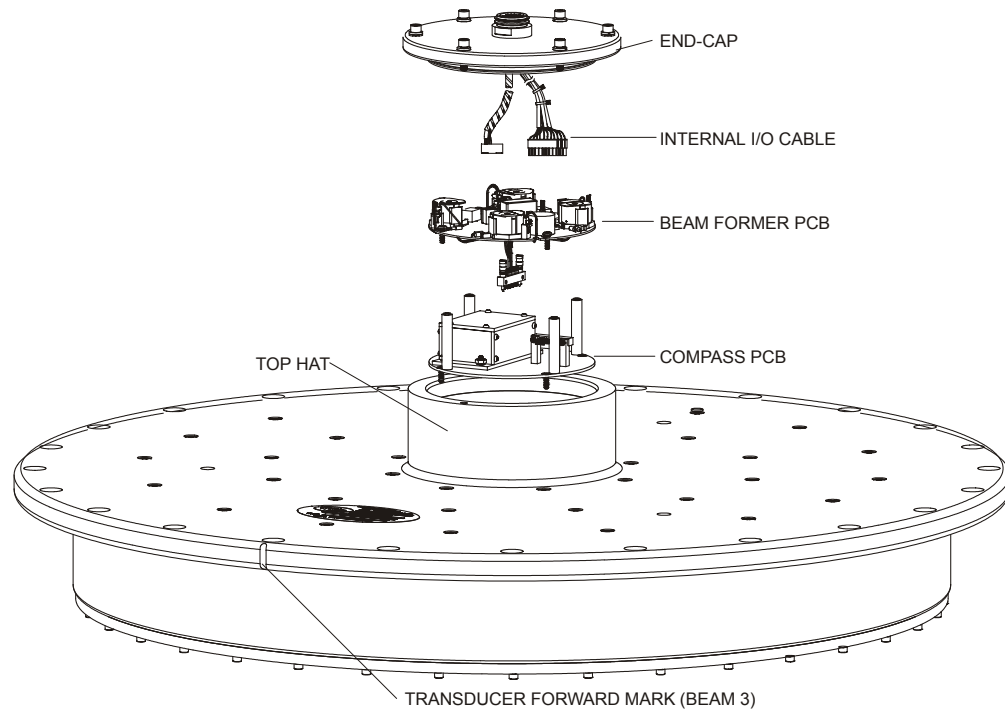


Figure 5. Transducer PCB Layout (38 kHz Round Transducer Shown)

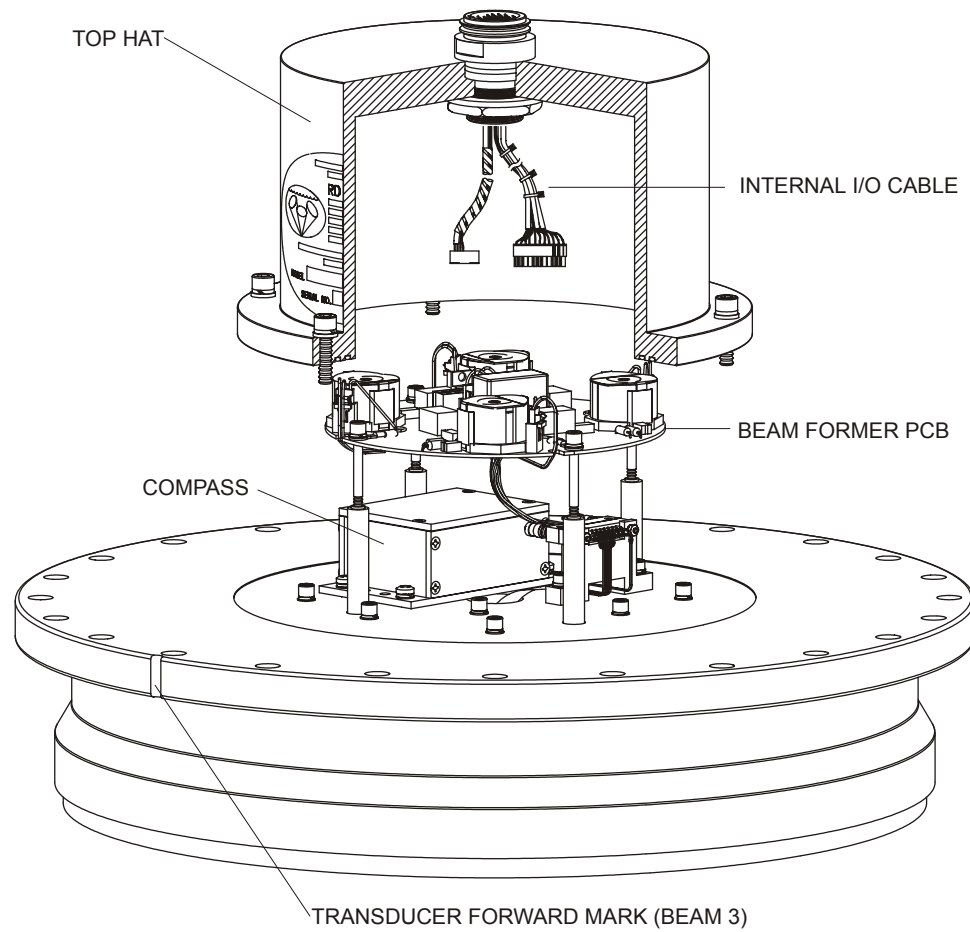


Figure 6. Transducer PCB Layout (75 kHz Transducer Shown)

5 Desiccant Bags

Desiccant bags are used to dehumidify the transducer housing interior. The factory-supplied desiccant lasts several years at specified Ocean Surveyor/Observer deployment depths and temperatures. Remember that desiccant rapidly absorbs moisture from normal room air.



NOTE. If the transducer housing has been opened, the desiccant should be replaced.

The average dry weight of a new desiccant bag is 7.2 grams ($\pm 5\%$). The weight increases to 8.4 to 9 grams for a “used” desiccant bag. Used desiccant bags may be dried at 250° for 14 hours. As a minimum, replace the desiccant bags whenever you are preparing to deploy or store the Ocean Surveyor/Observer for an extended time.



CAUTION. Do not open the desiccant bag. Contact with the silica gel can cause nose, throat, and skin irritation.



NOTE. Desiccant bags are shipped in an airtight aluminum bag to ensure maximum effectiveness. There is a moisture indicator inside the bag. If the moisture indicator is pink, do not use the desiccant bag until it has been dried.

- a. Remove the End-Cap/Top Hat assembly (see [Figure 5, page 7](#) and [Figure 6, page 8](#)).
- b. Remove the new desiccant bags from the airtight aluminum bag.
- c. Remove the old desiccant bags and install two new ones. Place the desiccant bags on top of the Beam Former board.
- d. Install the End-Cap/Top Hat assembly (see [Figure 5, page 7](#) and [Figure 6, page 8](#)).



NOTE. RDI recommends that the desiccant and Top Hat O-rings be replaced every three years. These parts are not included in the spare parts kit. Make sure you have replacement parts **before** opening the transducer.

6 O-Ring Inspection and Replacement

This section explains how to inspect/replace the Ocean Surveyor/Observer O-rings. A successful deployment may depend on the condition of these O-rings and their retaining grooves (see [Figure 7, page 11 through Figure 10, page 14](#)). Read all instructions before doing the required actions.

We strongly recommend replacing these O-rings whenever you open the transducer assembly. Inspecting and replacing the O-rings should be the last maintenance task done before installing the transducer.



NOTE. RDI recommends that the Top Hat O-rings be replaced whenever the transducer assembly is opened. These O-rings are **not** included in the spare parts kit. Make sure you have replacement parts **before** opening the transducer.

- a. Inspect the O-rings. When viewed with an unaided eye, the O-rings must be free of cuts, indentations, abrasions, foreign matter, and flow marks. The O-ring must be smooth and uniform in appearance. Defects must be less than 0.1 mm (0.004 in.).
- b. Clean and inspect the O-ring grooves. Be sure the grooves are free of foreign matter, scratches, indentations, corrosion, and pitting. Run your fingernail across damaged areas. If you cannot feel the defect, the damage may be minor; otherwise, the damage may need repair.
- c. Lubricate the O-ring with a **thin** coat of lubricant. Apply the lubricant using latex gloves. Do not let loose fibers or lint stick to the O-ring. Fibers can provide a leakage path.



NOTE. RDI uses Dow Corning's silicone lube model number 111 but any equivalent silicone O-ring lube can be used.



CAUTION. Apply a **very thin** coat of silicone lube on the O-ring. Using too much silicone lube on the O-ring can be more harmful than using no O-ring lube at all.



NOTE. During installation, do not cut or twist the O-ring. Never force O-rings over sharp corners, screw threads, keyways, slots, or other sharp edges.

- d. Use tweezers to install the 2-020 O-ring into the transducer I/O connector. Do not bend the connector pins.
- e. Install the I/O cable 2-022 O-ring by first lubricating the O-ring. Do not let lubricant enter the pinholes.



NOTE. Always check that the I/O cable (wet end) O-ring is in place when connecting the I/O cable to the transducer. The 2-022 O-ring has a tendency to fall out if the cable connector is dropped.

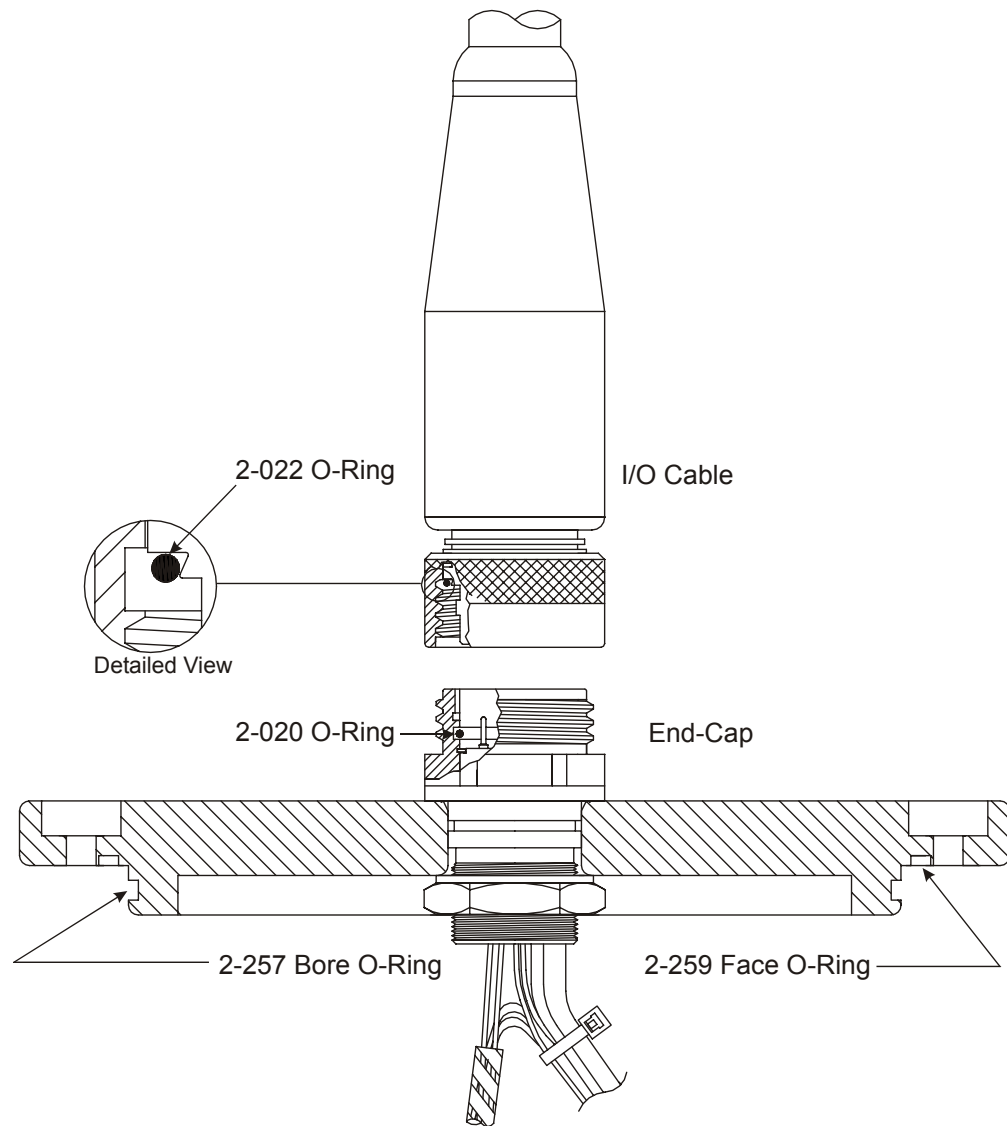


Figure 7. Ocean Surveyor/Observer 38kHz O-ring Locations (Early Phase 2 Builds)



NOTE. If your end-cap uses eight holes rather than six, the face O-ring is 2-164 and the bore O-ring is 2-256.

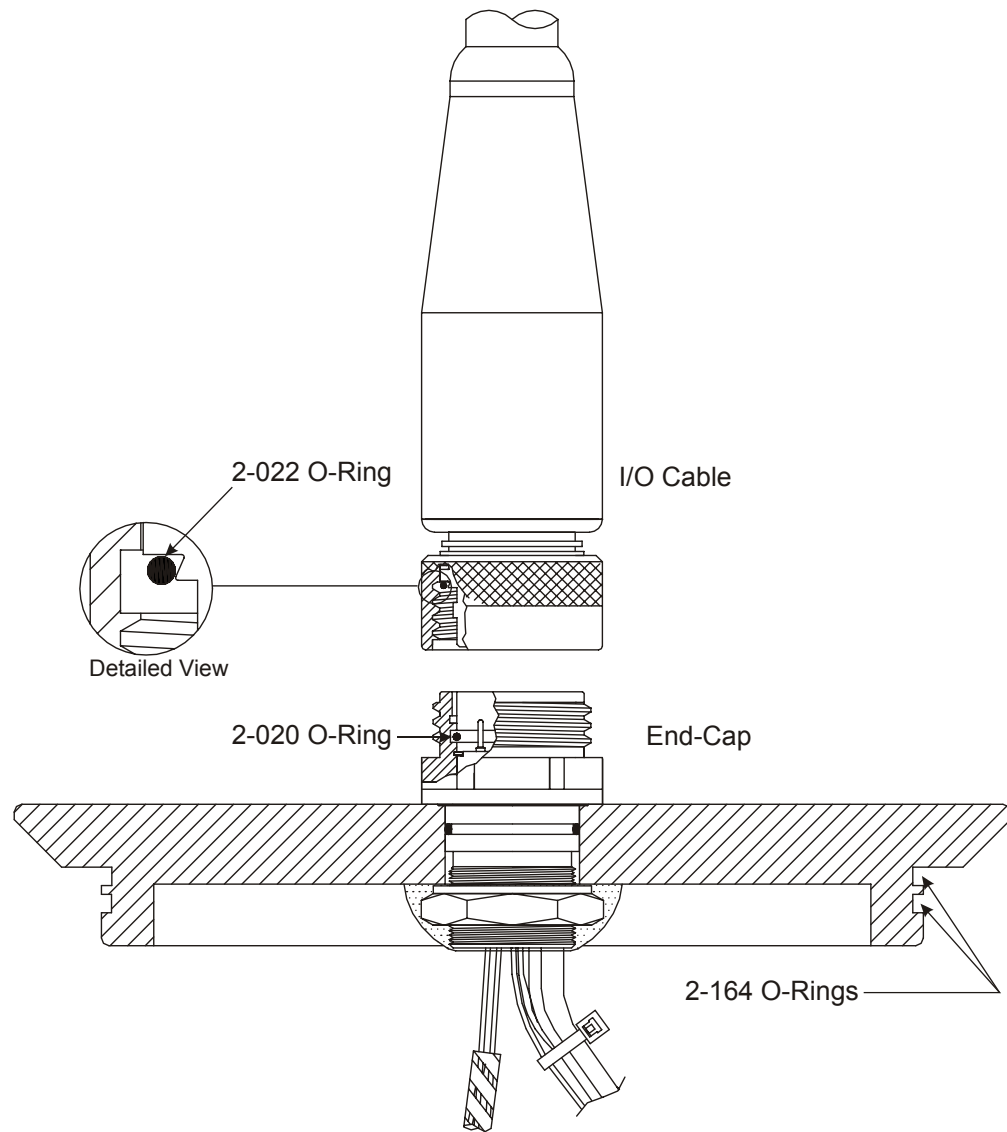


Figure 8. Ocean Surveyor/Observer 38kHz O-ring Locations (Standard Phase 2 Builds)

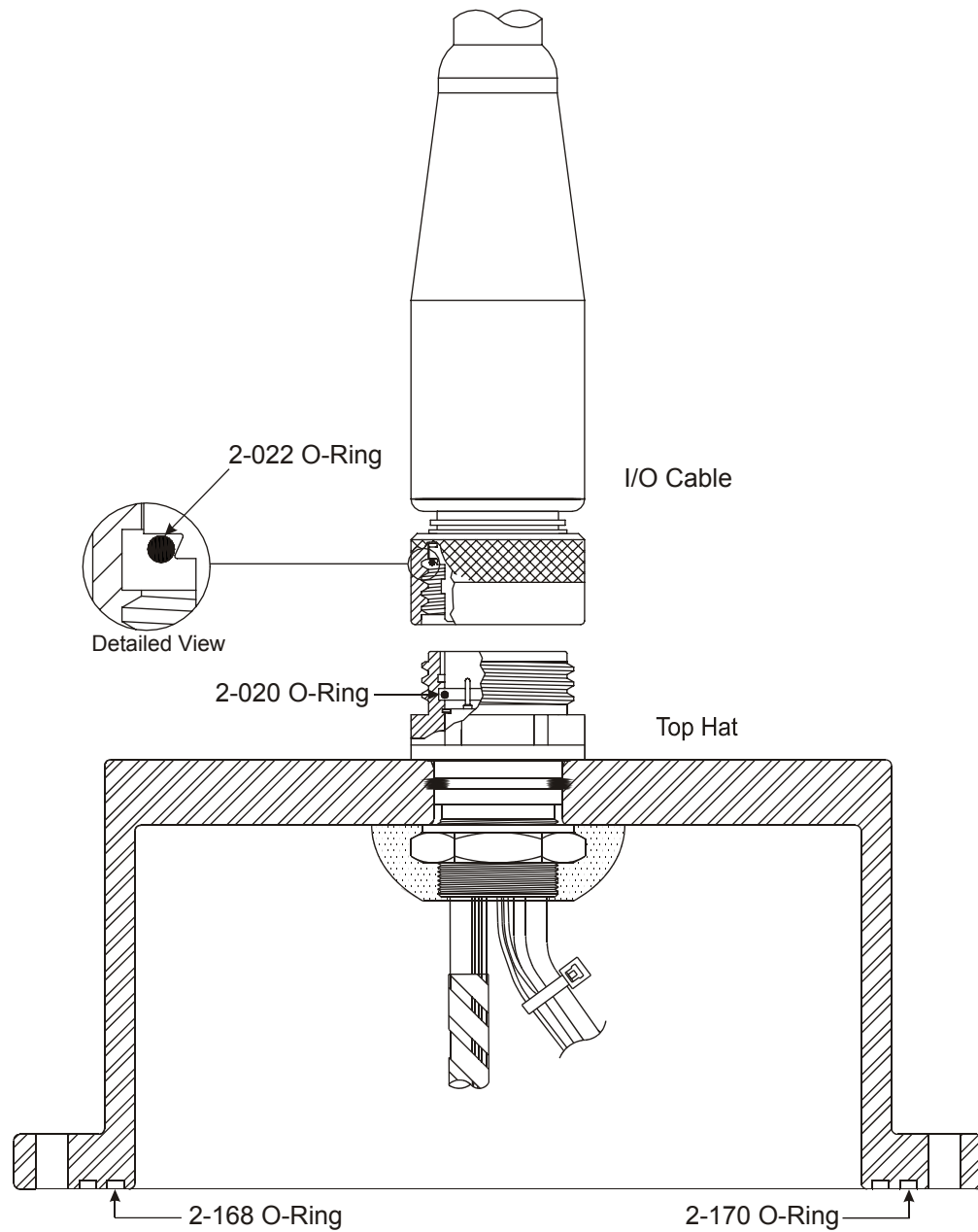


Figure 9. Ocean Surveyor/Observer 75kHz O-ring Locations

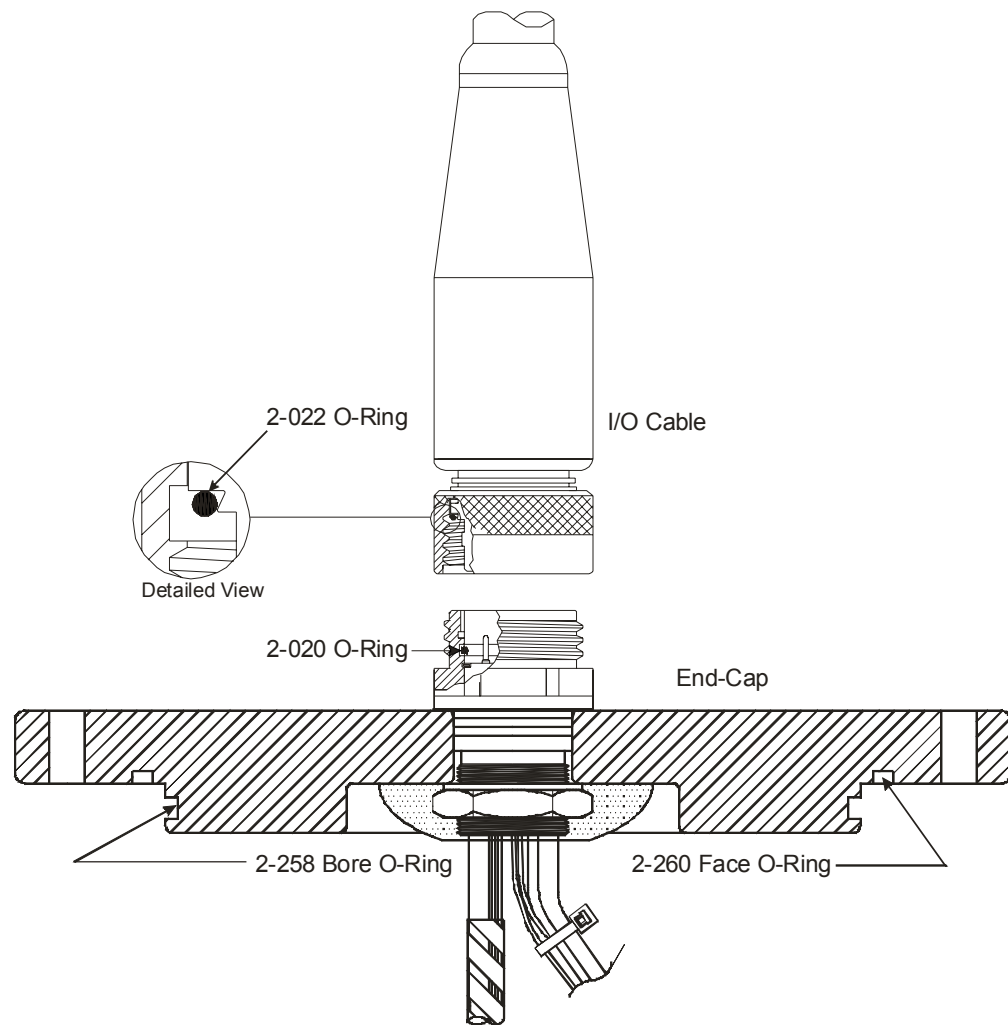


Figure 10. Ocean Surveyor/Observer 150kHz O-ring Locations

7 Fuse Replacement

A fuse on the Power Assembly board (see [Figure 2, page 3](#)) protects the Ocean Surveyor/Observer from excessive incoming power. If this fuse continues to blow, check your input power before applying power again.

- a. Turn off the power and disconnect the AC power cord.
- b. Remove the top cover of the electronic chassis (see “[Electronics Chassis Board Replacement,](#)” page 2). The fuse is located on the Power Assembly board ([Figure 2, page 3](#)).
- c. Gently pull the fuse from the clips.
- d. Replace the fuse with the correct voltage and amperage fuse (250 volt 25 amp, fast blow).



CAUTION. Only fuses with the required rated current, voltage, and specified type must be used. Do not repair fuses or short circuit fuse-holders. To do so could cause a shock or fire hazard.

- e. Install the top cover of the electronic chassis.
- f. Test the system (see the [Test Guide](#)).

8 Compass Calibration

Only Ocean Observer systems use the TCM2 compass and these systems are “designed” around use on an oil platform. The compass calibration must be performed on **land**, not on the deck of an oil platform. The platform’s motion and magnetic fields will likely prevent successful calibration.



NOTE. If you will deploy your Ocean Observer looking up, calibrate it looking up. If you will deploy it looking down, calibrate it looking down.

Compass calibration requires pitching and rolling the Ocean Observer transducer while rotating in a circle. Protect the ADCP’s transducer faces with a soft pad—never rest the transducer face on rough surfaces. If you are calibrating it the upward direction, you must carry the ADCP while doing the pitch, roll and rotations to protect the I/O cable.



NOTE. Due to the size and weight of the transducer, the compass calibration it is not recommended for the 75kHz and 38kHz Ocean Observers.



CAUTION. Never set the transducer faces on a hard or rough surface. Protect the urethane faces and I/O cable when rotating the ADCP during calibration.

8.1 TCM2 Compass Command Summary

This section defines the commands used by the Ocean Observer's TCM2 compass. The following commands are used to calibrate the TCM2 compass.



NOTE. You will not see the command being entered as you type (echo is turned off by default). Remember to press Enter after each command. You may need to press the H (halt) command more than once to stop the continuous output mode.

Table 2: TCM2 Dumb Terminal Commands

Command	Description
&m8	Enables communication access to the TCM2 compass through the RS-485 interface. The command prompt will change from a ">" to a "%" symbol.
cc	Clear calibration data.
AX	Warm reboot (also halts the continuous output mode).
GO	Enter continuous output mode.
H	Halt continuous sampling, enter standby mode.
LC?	Output last calibration score.
MPCAL	Type MPCAL=E to enter the multi-point calibration mode. Type MPCAL=D to disable the calibration mode.
?	Help – all TCM2 commands are displayed.
^e	Control-e enables echoing
^n	Control-n disables echoing

8.2 TCM2 Field Calibration Procedure



NOTE. Only Ocean Observer systems use the TCM2 compass and these systems are "designed" around use on an oil platform. The compass calibration must be performed on land, not on the deck of an oil platform. The platform's motion and magnetic fields will likely prevent successful calibration.

- Connect the Ocean Observer to power and a computer as shown in the User's Guide. The compass calibration requires that you send commands directly to the ADCP using *BBTalk*.
- Start *BBTalk*. Type in the command **&M8** and press the **Enter** key.
- Type **H** to halt continuous sampling.
- Type **CC** to clear previous calibration values.
- Type **MPCAL=E** to enter the multi-point calibration mode.

- f. Type **GO** to begin taking calibration samples.
- g. Rotate the ADCP approximately one turn per minute while pitching and rolling the Ocean Observer as much as possible. The turn does not have to be a perfect circle. In the calibration mode, the TCM2 is trying to take as many different data points as possible to determine the magnetic anomalies. The more pitch and roll points you give it, the better it is able to determine the vertical magnetic fields. You can exceed the range of the inclinometer (greater than 20°) without effecting the calibration. After rotating the ADCP *at least* once (twice would be better), continue to step “h”.



NOTE. If the ADCP is mounted to a boat or other vehicle, rotate and “rock” the boat.

- h. Type **H** to halt acquisition of calibration samples.
- i. Type **MPCAL=D** to exit the multi-point calibration mode.
- j. Type **LC?** to retrieve the calibration score. The calibration score has the following format: HnVnMn.

The first two numbers in the calibration score, HnVn, respectively describe the quality of the calibration for the horizontal and vertical component of the ADCPs local magnetic fields. Higher numbers (maximum = 9) reflect higher quality. The factors that contribute to a good score for Hn and Vn are:

- A good, magnetically quiet location was chosen for the user calibration procedure.
- The magnetic environment around the ADCP is stable — there were no large sources of changing fields during the calibration.
- The calibration data points included a change in the ADCPs inclination to allow for measurement of the vertical distortion field.
- There are no significant soft-iron distortion effects.

The last number in the score, Mn.nn, describes the magnitude of the local field generated by the ADCP. Larger numbers denote strong local fields. Small local fields are preferable, since less correction will be necessary. Magnitude scores greater than 30.0 indicate strong fields at the TCM2 location, and may warrant investigation. A good reading is below 2.00 with minimal local magnetic disturbances.

As an example, a good calibration score would be H9V9M1.32. A poor score is H5V2M1.32 or H9V2M1.32. If the score is poor, re-

peat steps e through k. If the score can not be improved, change the location of the ADCP and try the calibration procedure again.



CAUTION. By default the watchdog timer for the electronics will be enabled (jumper W1 on the Electronics Chassis Motherboard). As a result this test will automatically halt after 1 minute. What will be seen is the OS ADCP wake-up message followed by the prompt. To restart the test start at step h.

If this test must be run continuously then remove jumper W1 on the Electronics Chassis Motherboard to disable the watchdog timer. Remember to place the jumper back in place for normal operation.

k. Type **GO** to enter the continuous output mode, using the corrections.



CAUTION. If you forget this step, the compass will not output any data.

l. Exit *BBTalk*.

9 Transducer Head Inspection

The seal on the transducer face is important to ADCP watertight integrity. Mishandling, chemicals, abrasive cleaners, and excessive depth pressures can damage the transducer ceramics. Inspect the transducer face for dents, chipping, peeling, urethane shrinkage, hairline cracks, and damage that may affect watertight integrity or transducer operation. Repair of the transducer face should only be done by RDI.



CAUTION. Never set the transducer on a rough surface; always use soft padding no thicker than 1/4" to protect the transducers. Thicker padding may allow the transducer face to flex, causing the ceramics to crack.

10 Prevention of Biofouling

This section explains how to prevent the buildup of organic sea life (biofouling) on the transducer faces. Objects deployed within about 100 meters (≈ 328 feet) of the surface are subject to biofouling, especially in warm water. This means all vessel-mounted deployments are subject to biofouling. Soft-bodied organisms usually cause no problems, but barnacles can cut through the urethane transducer face causing failure to the transducer and leakage into the ADCP. Therefore, you should take steps to prevent biofouling during shallow water deployments.

Some organizations may decide to use antifouling grease. However, most antifouling greases are toxic and may cause problems. Recent tests suggest antifouling grease may cause the urethane on the transducer faces to develop cracks. Warmer temperatures accelerate this effect. If using antifouling grease, remove the grease immediately after recovering the ADCP from

its deployment. Remove the grease with soapy water because cleaning solvents may also cause the urethane to crack. Be sure to wear protective gloves and a face shield.

The best-known way to control biofouling is cleaning the ADCP transducer faces often. However, in many cases this is not possible. The following options can help reduce biofouling.

- a. Cover the transducer face using the recommended antifouling paint.
- b. Apply a thin coat (≈ 4 mm, ≈ 0.16 in.) of either a 50:50 mix of chili powder and Vaseline or chili powder and silicone grease to the transducer faces. The chili powder should be the hottest that can be found. Water flowing across the transducers will wash this mix away over time. The silicone mixture tends to last longer.
- c. Using an acoustic window over a sea chest filled with fresh water (see the [Installation Guide](#)). The drawback to this method is that it reduces the range of the ADCP.

CAUTION. If using antifouling grease, remove it immediately after recovering the ADCP.

Antifouling grease is toxic. Read the product safety data sheet before using the grease. Wear gloves and a face shield when applying the grease. If the skin comes in contact with the grease, immediately wash the affected area with warm, soapy water.



Do not coat the transducer face with paints such as copper, chrome, or arsenic. These paints advance the corrosion of the aluminum case and transducer assembly.

All US coastal states prohibit the use of tributyl-tins (TBT) paint. The European economic commission has released a draft directive that would prohibit the use of many organo-tins after July 1989. We strongly recommend you obey your local laws.

Never use anti-foulant paints containing copper. They will cause the urethane to separate from the transducer.

10.1 Antifouling Paint Recommendations

RDI no longer recommends the use of Nopocide for the prevention of biofouling. At present, we recommend the following antifouling paint manufacturer, paint brand, and preparation procedures for all ADCPs.

Manufacturer	Contact
Courtaids Finishes	Telephone: 908-686-1300
Interlux brand paints	Web Page: www.interlux.com

10.2 Brass and Bronze Instruments

Use the following procedure on instruments with brass and bronze cases.

Metal Surfaces

a. Metal Surface Preparation

1. Sand metal surfaces with 60-grit paper to expose clean metal.
2. Clean surface with 353/354 Vinylux solvent (thin with 355 as needed). Perform the Metal Surface Application (Step (b), below) between 1 and 24 hours.

b. Metal Surface Application

1. Apply a barrier coat of 360R Underwater Metal Primer to all exposed brass. Allow the primer to dry for 5 to 8 hours before proceeding.
2. Mask as necessary to avoid having the cuprous oxide antifouling paint come in contact with any bare metal surfaces.
3. Apply cuprous oxide 669 antifouling paint as desired. If more than one coat is used, allow each coat to dry for 16 hours.

Transducer Face

a. Surface Preparation - Lightly sand by hand with 120-grit paper.

b. Surface Application

1. Mask as necessary to avoid having the cuprous oxide antifouling paint come in contact with any bare metal surfaces.
2. Apply a thin barrier coat of 360R Underwater Metal Primer. Allow the primer to dry for 5 to 8 hours before proceeding.
3. Apply cuprous oxide 669 antifouling paint. Do not exceed the maximum thickness specified in [Table 3](#). If more than one coat is needed to reach the maximum thickness, allow each coat to dry for 16 hours.

Table 3: Recommended Maximum Thickness Of Cuprous Oxide 669 Paint

System Frequency	Maximum Paint Thickness*
38 kHz	1.00 mm (0.040 in.)
75 kHz	1.00 mm (0.040 in.)
150 kHz	0.50 mm (0.020 in.)



NOTE. Cuprous oxide 669 is a high-density paint. As such, using it will slightly degrade ADCP performance. Exceeding these recommended maximum thickness would further degrade performance.



CAUTION. Read the Material Safety Data Sheet before using any of the listed solvents and paints.

Do not arbitrarily use antifouling paints for deep-water applications. For shallow-water applications, using antifouling paints may be appropriate if you cannot clean the ADCP regularly (weekly). Be aware that antifouling paints can accelerate the corrosion of aluminum housings, and can initiate dezincification corrosion of brass. Once initiated, dezincification will rapidly destroy the transducer.

Some antifouling coatings may not be legal for use in all areas. Check with your local environmental agency before using the antifouling paint.

11 Storage and Shipping Maintenance

This section lists the maintenance items to do before storing the ADCP. These maintenance items include

- Cleaning the ADCP with fresh, soapy water and rinse thoroughly.
- Removing biofouling
- Inspecting the transducer head
- Inspecting/replacing the O-rings
- Preparing the ADCP for final storage or shipping

11.1 Removal of Biofouling

Before storing or shipping the ADCP, remove all foreign matter and biofouling. Remove soft-bodied marine growth or foreign matter with soapy water. Waterless hand cleaners remove most petroleum-based fouling. Rinse with fresh water to remove soap residue. Dry the transducer faces with low-pressure compressed air or soft lint-free towels.



CAUTION. The soft, thin urethane coating on the transducer faces is easily damaged. Do not use power scrubbers, abrasive cleansers, scouring pads, high-pressure marine cleaning systems, or brushes stiffer than hand cleaning brushes on the transducer faces.

If there is heavy fouling or marine growth, the transducer faces may need a thorough cleaning to restore acoustic performance. We do recommend removal of the barnacles to prevent water leakage through the transducer face, and to keep the shells from trapping air, which will block the signal. Lime dissolving liquids such as Lime-Away™ break down the shell-like parts. Scrubbing with a medium stiffness brush usually removes the soft-bodied parts. Scrubbing, alternated with soaking in Lime-Away™, effectively removes large barnacles. After using Lime-Away™, rinse the ADCP with fresh water to remove all residues. If barnacles have entered more than

1.0-1.5 mm (0.04-0.06 in.) into the transducer face, you should send the ADCP to us for repair. If you do not think you can remove barnacles without damaging the transducer faces, contact RDI.

11.2 Final Storage or Shipping Preparation

This section explains how to store or ship the ADCP.

Clean and inspect the I/O connector and dummy plug for water or salt residue. Clean the I/O cable O-rings (bore and face). Install the dummy plug to protect the I/O connector from damage and dust.



CAUTION. If you are shipping an ADCP to RDI for repair or upgrade, remove all customer-applied coatings or provide certification that the coating is nontoxic. This certification must include the name of a contact person who is knowledgeable about the coating, the name, and manufacturer of the coating, and the appropriate telephone numbers. If you return the equipment without meeting these conditions, we have instructed our employees not to handle the equipment and to leave it in the original shipping container pending certification. If you cannot provide certification, we will return the equipment to you or to a customer-specified cleaning facility. All costs associated with customer-applied coatings will be at the customer's expense.

When shipping the ADCP through a Customs facility, be sure to place the unit/s so identifying labels are not covered and can be seen easily by the Customs Inspector. Failure to do so could delay transit time.

12 Returning ADCPs to RDI for Service

When shipping the ADCP to RDI from either inside or outside the United States, the following instructions will help ensure the ADCP arrives with the minimum possible delay. Any deviation from these instructions increases the potential for delay.

12.1 Domestic Shipments

Step 1 - Get a Return Authorization

The best way to make sure RDI is aware of your intentions to ship equipment is to obtain a Return Authorization (RA) before sending the shipment. Return Authorizations are issued by Sales Administration or Customer Service and are used to notify us of your needs in advance of arrival so we can provide a faster turnaround. When requesting a Return Authorization, please give us the following information.

- What is being shipped (include the serial number)
- When you plan to send the shipment
- What problem(s) need correction
- When you need the instrument returned

When the Return Authorization is issued, we will tell you the RA number. Please include this number on all packages and correspondence.

Step 2 - Ship via air freight, prepaid



CAUTION. Never ship the Workhorse with lithium batteries inside. Lithium batteries must be packaged and shipped according to the hazardous materials regulations of the International Air Traffic Association (IATA) via Air Cargo only.

Urgent Shipments should be shipped direct to RDI via any of several overnight or priority air services. Do not send urgent airfreight as part of a consolidated shipment. If you ship consolidated, you will save money, but may lose up to three days in transit time.

Non-urgent shipments may be shipped as part of a consolidated cargo shipment to save money. In addition, some truck lines may offer equivalent delivery service at a lower cost, depending on the distance to San Diego.

Mark the Package(s)

To: RD Instruments, Inc. (RA Number)
9855 Businesspark Avenue
San Diego, CA 92131-1101

Step 3 - Urgent shipments

Send the following information by fax or telephone to RDI.

Attention: Sales Administration

Fax: +1 (858) 695-1459

Phone: +1 (858) 693-1178

- Detailed descriptions of what you are shipping (number of packages, sizes, weights, and contents).
- The name of the freight carrier
- Master Air bill number
- Carrier route and flight numbers for all flights the package will take

12.2 International Shipments

Step 1 - Get a Return Authorization

The best way to make sure RDI is aware of your intentions to ship equipment is to obtain a Return Authorization (RA) before sending the shipment. Return Authorizations are issued by Sales Administration or Customer Service and are used to notify us of your needs in advance of arrival so we can provide a faster turnaround. When requesting a Return Authorization, please give us the following information.

- What is being shipped (include the serial number)
- When you plan to send the shipment
- What problem(s) need correction
- When you need the instrument returned

When the Return Authorization is issued, we will tell you the RA number. Please include this number on all packages and correspondence.

Step 2 - Ship Via Air Freight, Prepaid



CAUTION. Never ship the Workhorse with lithium batteries inside. Lithium batteries must be packaged and shipped according to the hazardous materials regulations of the International Air Traffic Association (IATA) via Air Cargo only.

Urgent Shipments should be shipped direct. Do not send urgent airfreight as part of a consolidated shipment. If you ship consolidated, you will save money, but may lose up to five days in transit time.

Non-urgent shipments may be shipped as part of a consolidated cargo shipment to save money.

Mark the package(s) as follows:

To: RD Instruments, Inc. (RA Number)
9855 Businesspark Avenue
San Diego, CA 92131-1101 USA
C/O: Paxton, Shreve & Hays
Lindbergh Field, San Diego Airport
2361 Airline Drive, #D
San Diego, CA 92101

Notify upon arrival
Phone: 858-692-3113
Fax: 858-692-0539

Step 3 - Include Proper Customs Documentation

The Customs statement should be completed very carefully. It should accurately and truthfully contain the following information.

- Contents of the shipment
- Value
- Purpose of shipment (example: "American made goods returned for repair")
- Any discrepancy or inaccuracy in the Customs statement could cause the shipment to be delayed in Customs.

Step 4 - Send the Following Information by Fax or Telephone to RDI

Attention: Sales Administration
Fax: +1 (858) 695-1459
Phone: +1 (858) 693-1178

- Detailed descriptions of what you are shipping (number of packages, sizes, weights, and contents).
- The name of the freight carrier
- Master Air bill number
- Carrier route and flight numbers for all flights the package will take

NOTES